PROPOSED

COVERED SOURCE PERMIT (CSP) REVIEW (0489-01-C)
Covered Source Permit Application No. 0489-01

APPLICANT:	Waste Management Hawaii Inc.
LOCATION:	Waimanalo Gulch Municipal Solid Waste Landfill 92-460 Farrington Hwy Kapolei, HI 96707
UTM Coordinates:	2,363,000 meters N, 589,100 meters E
RESPONSIBLE OFFICIAL:	Dr. Eric S. Takamura Director, Environmental Services Department City and County of Honolulu 1000 Uluohia Street, Suite 308 Kapolei, HI 96707
POC:	Mr. Joseph Hernandez Vice-President/General Manager Hawaii Market Area 92-460 Farrington Highway Kapolei, HI 96707
CONSULTANT:	Mr. Paul Stout Shaw EMCON/OWT, Inc. 4005 Port Chicago Highway Concord, CA 94520-1120
SIC CODE:	4953 (Refuse Systems)

PROPOSED PROJECT:

Waimanalo Gulch Landfill is the primary landfill for the island of Oahu. The landfill began accepting waste in September 1989 and was last expanded in 2002. The landfill accepts municipal solid waste (MSW) and incinerator ash from a municipal waste combustor. Construction and demolition waste was accepted until 1998. Hazardous waste is not accepted.

The proposed project is for the installation and operation of an active landfill gas collection and control system for an existing municipal solid waste landfill that was modified after May 30, 1991. The collection and control system is required to be installed pursuant to EPA New Source Performance Standards (NSPS) because the landfill: (1) was last expanded after May 30, 1991, (2) has a design capacity greater than 2.5 million megagrams (Mg) and 2.5 million cubic yards; and (3) has an estimated annual non-methane organic compound (NMOC) emission rate of more than 50 Mg/yr.

The collection and control system consists of vertical extraction wells, wellheads, lateral and header pipes, a condensate knockout pot, two landfill gas (LFG) blowers, a flame arrestor, enclosed flare, and flare controls.

The components are described in the following paragraphs:

<u>Extraction Wells</u> - Vertical LFG extraction wells will be installed at approximately 200 to 250 foot spacing in all areas of the landfill requiring LFG extraction. A typical vertical extraction well consists of a lower casing of perforated high density polyethylene (HDPE) pipe and an upper casing of solid HDPE pipe. The lower perforated casing allows LFG to enter the LFG well casing. A vacuum applied to the LFG header piping and the LFG extraction wells is the driving force to draw the LFG into the well casing. The upper casing is solid to maximize any intrusion of surface air, which can lower the concentration of methane, thus lowering the effectiveness. The equipment list on the permit does not specify what type of wells are to be used in case both horizontal and vertical wells are used.

<u>Wellhead Assemblies</u> - Each well is connected by a PVC well head monitoring assembly to a HDPE lateral pipe, which conveys LFG to the header pipe. Each wellhead monitoring assembly includes a poly vinyl chloride (PVC) gate valve for LFG flow control, a PVC labcock for LFG monitoring as well as an access point which enables connection of instruments for LFG composition, temperature, and pressure monitoring. A flexible hose connection to the HDPE lateral will isolate the will and monitoring assembly from forces exerted by the lateral pipe and allows a limited amount of differential movement to occur.

<u>LFG Lateral/Header Piping</u> - The main header pipe will collect the LFG from the well laterals and convey it to the flare station. Manually operated butterfly valves are installed at various sections of the header pipe to allow rapid adjustment or isolation of LFG flow from large sections of the landfill. A shut-off butterfly valve is also installed at the termination of the 12-inch diameter main header at the inlet to the flare skid for total system shutdown. A combination labcock and Pitot tube access port is provided near each butterfly valve to allow monitoring of LFG parameters.

<u>Condensate Knock-out Pot</u> - The purpose of the condensate knock-out pot (KOP) is to remove excess moisture and large particles from the LFG flow stream which might otherwise impact the blower or other sensitive components on the flare skid or in the LFG transmission system. The KOP consists of a polymer lined steel vessel which provided a directional change and a decrease in LFG velocity in addition to a stainless steel demister pad with approximately 10 micron filtration capability. A 2-inch diameter liquid drain is provided at the bottom of the KOP and is connected to the flare station condensate storage tank for later disposal.

<u>LFG Blower</u> - The flare skid LFG blower provides the vacuum and pressure required to extract LFG from the landfill and convey it to the flare. The LFG blower is a radial blade fan with a maximum capacity of 700 cubic feet per minute (scfm). Manually operated butterfly valves are provided at the blower inlet and outlet for control of the LFG flow rate. The blower power supply and controls are located in the motor control panel mounted on the skid electrical controls rack.

Flame Arrestor - The purpose of the flame arrestor is to prevent the backward propagation of flame from the flare burner tip into the flare skid piping and blower.

Enclosed Flare - The LFG Specialties enclosed flare is designed to combust LFG at a rate of approximately 1000 scfm of LFG at 50 percent methane by volume. The flare will burn LFG at an operating temperature in excess of 1,400 degrees Fahrenheit to meet air quality regulations for emissions.

Controls - The blowers and enclosed flare can be operated in either manual or automatic mode. The flare should only be operated in manual mode for short periods, and only when trained personnel are in attendance. In automatic mode, the following controls are activated and provide redundant safeguards and effective combustion of LFG. The following briefly discusses the main controls:

- Pilot Burner Control - The purpose of the pilot burner control is to determine that a sufficient pilot flame is present to ignite a LFG stream.

- Ultraviolet Light Flame Scanner - The purpose of the ultraviolet (UV) flame scanner is to monitor for the presence of the LFG flame at the flame burner and automatically shut down operation and close the pneumatic LFG valve if the flame is not detected.

- Auto-Dialer Alarm - An automatic phone dialer will call up to eight phone numbers, report a flare shut down condition, and will indicate the reason for the flare shut down. The auto-dialer is installed on the flare skid control rack.

- System Shut-down on Power Failure - In the event of an electrical power failure, the motor driven blower will cease operation. Due to the interruption of LFG flow, the flare will be extinguished. In addition, the pneumatically actuated LFG valve will close. Upon the restoration of electrical power, the ultraviolet flame scanner will recognize that the main flame is not ignited and will only restart the flare after completing the appropriate start up sequence.

APPLICABLE FEDERAL REQUIREMENTS:

40 CFR Part 60, Subpart WWW - *Standards of Performance for Municipal Solid Waste Landfills*

This federal emission standard applies to landfills which were constructed or modified after May 30, 1991 and have a design capacity greater than 2.5 million megagrams and 2.5 million cubic meters. The Waimanalo Gulch Landfill exceeds the 2.5 million megagram and 2.5 million cubic meter limit, and was modified after May 30, 1991. Therefore, it is an applicable facility.

40 CFR Part 63, Subpart AAAA - *National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills*

The facility is subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for landfills because waste has been accepted after November 8, 1987, has a design capacity greater than 2.5 million megagrams and 2.5 million cubic meters, and has estimated uncontrolled nonmethane organic compound (NMOC) emissions equal to or greater than 50 megagrams per year. Facilities are not subject to the NESHAP regulations unless the 50 Mg/yr annual emission limit is exceeded.

The NESHAP rule adds startup, shutdown and malfunction requirements, adds operating condition deviations for out-of-bounds monitoring parameters, requires timely control of bioreactor landfills, and changes the reporting frequency for compliance reporting from annually to every six months.

<u>APPLICABLE STATE REQUIREMENTS</u>:

Hawaii Administrative Rules (HAR)
- Chapter 11-59, Ambient Air Quality Standards
- Chapter 11-60.1, Air Pollution Control
  - Subchapter 1, General Requirements
  - Subchapter 2, General Prohibitions
    - 11-60.1-31 Applicability
    - 11-60.1-32 Visible Emissions
    - 11-60.1-33 Fugitive Dust
    - 11-60.1-38 Sulfur Oxides from fuel combustion
  - Subchapter 5, Covered Sources
  - Subchapter 6, Fees for Covered Sources, Noncovered Sources, & Agricultural Burning
    - 11-60.1-111 Definitions
    - 11-60.1-112 General fee provisions for covered sources
    - 11-60.1-113 Application fees for covered sources
    - 11-60.1-114 Annual fees for covered sources
  - Subchapter 8, Standards of Performance for Stationary Sources
  - Subchapter 9, Hazardous Air Pollution Sources

<u>AIR POLLUTION CONTROL EQUIPMENT</u>:

Landfills subject to NSPS that have a calculated uncontrolled NMOC emission rate of greater than 50 megagrams per year are required to install a gas collection and control system. The collection and control system is required by NSPS to be designed and operated to reduce NMOC by 98 weight-percent, or to reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen. The active collection and control system consists of vertical extraction wells, wellheads, lateral and header pipes, a condensate knockout pot, two landfill gas (LFG) blowers, a flame arrestor, enclosed flare, and flare controls.

<u>PREVENTION OF SIGNIFICANT DETERIORATION (PSD)</u>:
PSD review requirements apply to existing MSW landfill sources that undergo a modification resulting in increases in landfill gas emissions of greater than 50 tons per year. Installation of a landfill gas collection and control system will decrease landfill gas emissions by extracting and combusting landfill gas previously released to the atmosphere. Therefore, a PSD review is not required for this project.

<u>COMPLIANCE DATA SYSTEM (CDS)</u>:
The facility is subject to Federal New Source Performance Standards. Therefore, the facility is subject to CDS reporting requirements.

<u>CONSOLIDATED EMISSIONS REPORTING REQUIREMENTS (CERR)</u>:
The facility is subject to the consolidated emissions reporting rule (CERR). The level of emissions require that reporting be done a minimum of once every three years.

<u>SYNTHETIC MINOR APPLICABILITY</u>:
The facility is not proposing any operational restrictions and does not exceed major source emission levels. Therefore, the facility is not a synthetic minor source.

<u>COMPLIANCE ASSURANCE MONITORING</u>:
Compliance Assurance Monitoring (CAM) applies to facilities that fulfill all of the following criteria:

1. Facility is a major source that is required to obtain a part 70 (Title V) or 71 (Federal Plan) permit.
2. Facility is subject to emission limitation or standard for the applicable pollutant.
3. Facility uses a control device to achieve compliance.
4. Potential pre-control emissions of applicable pollutant are at least 100 percent of major source amount.

Although the facility fulfills all of the aforementioned criteria, it is exempted from CAM requirements since it is subject to a federal standard (NSPS or NESHAPS) promulgated after November 15, 1990. The landfill NSPS was promulgated on March 12, 1996, and thus the landfill gas collection and control equipment are exempt from CAM provisions.

<u>BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS</u>:
BACT standards do not apply to MSW landfills. If landfill emissions exceed 50 megagrams per year, the landfill is required to install a gas collection and control system subject to Maximum Achievable Control Technology (MACT) standards. MACT standards are more stringent than BACT standards, so BACT does not apply in this case.

INSIGNIFICANT ACTIVITIES/EXCEPTIONS:
Insignificant activities listed by the applicant consist of one (1) 6,000 gallon underground storage tank for diesel fuel and one (1) 275 gallon aboveground storage tank for waste oil. The tanks are insignificant pursuant to HAR §11-60.1-82(f)(1). The section exempts "any storage tank, reservoir, or other container of capacity less than forty thousand gallons storing volatile organic compounds, except those storage tanks, reservoirs, or other containers subject to any standard or requirement".

ALTERNATIVE OPERATING SCENARIOS:
The application described two possible waste acceptance scenarios. The first scenario assumed a MSW refuse deposition rate of 390,000 tons per year, while the second assumes that the Honolulu Resource Recovery Venture Incinerator is not operational for three months of the year, increasing the deposition rate to 512,000 tons per year. Because the only change in operating scenarios is the deposition rate, all calculations assumed a deposition rate of 512,000 tons per year for conservatism, and has not been addressed as an alternate operating scenario.

PROJECT EMISSIONS:
Emissions from the landfill were determined to come from one of three sources; fugitive emissions from material handling and transfer (paved and unpaved roads), landfill surface emissions, and control device emissions.

Material Handling and Transfer (Paved and Unpaved Roads)
Fugitive emissions from paved roads, unpaved roads, and material handling were obtained by using the following AP-42 emission factors:

- Section 13.2.1 for paved roads (12/03).
- Section 13.2.2 for unpaved roads (12/03).
- Section 13.2.4 for material handling (1/95).

To determine the emission rate from paved roads, the following equation was used:

$$E = k\left(\frac{sL}{2}\right)^{0.65}\left(\frac{W}{3}\right)^{1.5} - C$$

Where; E = particulate emission factor (having units matching the units of k)
k = particle size multiplier (lb/vehicle mile traveled factor used))
sL = road surface silt loading (g/m^2)
W = average weight (tons) of the vehicles traveling the road
C = emissions factor for 1980's vehicle fleet exhaust, brake wear and tire wear

The emission rate (E) calculated is then multiplied by the number of miles traveled per year on paved roads to determine the amount of emissions. The resulting emissions are listed in the following table:

Vehicle Paved Road Emissions

Pollutant	k[1]	sL[2]	W[3] (tons)	C[3]	E (lb/mile)	miles traveled [4]	Emissions (tpy)
PM	0.082	7.40	14.80	0.00047	2.10	54,161	56.950
$PM_{2.5}$	0.004	7.40	14.80	0.00036	0.10	54,161	2.789
PM_{10}	0.016	7.40	14.80	0.00047	0.41	54,161	11.103

1 Obtained from AP-42, table 13.2.1-1
2 Obtained from AP-42, table 13.2.1-4
3 Obtained from AP-42, table 13.2.1-2
4 Provided by applicant

For unpaved roads, the equation for an industrial site was used. (Equation 1a, section 13.2.2.2)

$$E = k\left(\frac{s}{12}\right)^{a}\left(\frac{W}{3}\right)^{b}$$

Where; E = particulate emission factor (lb/vehicle mile traveled)
k = particle size multiplier (lb/vehicle mile traveled)
s = surface material silt content (%)
W = average weight (tons) of the vehicles traveling the road

The emission rate (E) is then multiplied by the number of miles traveled per year on unpaved roads. The resulting emissions are listed in the following table:

Vehicle Unpaved Road Emissions

Pollutant	s[1]	W[2]	k[3]	a[3]	b[3]	E(lb/mile)	miles traveled [4]	Emissions (tpy)
PM	6.4	14	4.9	0.7	0.45	6.312	18,054	56.98
$PM_{2.5}$	6.4	14	0.23	0.9	0.45	0.296	18,054	2.67
PM_{10}	6.4	14	1.5	0.9	0.45	1.932	18,054	17.44

1 surface material silt content (%); from AP-42 table 13.2.2-1
2 mean vehicle weight (tons); provided by applicant
3 from AP-42, table 13.2.2-2
4 Provided by applicant

The emission rate for material handling was obtained using the following equation:

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where; E = particulate emission factor (lb/tons of material)
k = particle size multiplier (dimensionless)
U = mean wind speed, miles per hour
M = material moisture content (%)

The emission rate is then multiplied by the total amount of material handled to determine annual emissions. The parameters used, the calculated emission rate (E) and the resulting emissions are listed in the following table:

Material Handling Emissions

Pollutant	k[1]	U[1]	M[2]	E (lb/ton)	material handled (tons)[3]	Emissions (tpy)
PM	0.74	15	12	8.04e-04	230,040	0.0925
$PM_{2.5}$	0.11	15	12	1.20e-04	230,040	0.0138
PM_{10}	0.35	15	12	3.80e-04	230,040	0.0437

[1] from AP-42, section 13.2.4, Aggregate Handling and Storage Piles
[2] moisture content (from AP-42, table 13.2.4.1)
[3] information provided by applicant

The total emissions resulting from material handling and transfer are as follows:

Summary: Material Handling and Transfer Emissions (TPY)

Pollutant	Paved Roads	Unpaved Roads	Material Handling	Total
PM	56.95	56.98	0.09	114.02
$PM_{2.5}$	2.79	2.67	0.01	5.48
PM_{10}	11.10	17.44	0.04	28.59

<u>Landfill Surface Emissions</u>

The Emissions generated at the landfill surface were calculated using a spreadsheet developed by GC Environmental. The spreadsheet utilizes the same algorithm as the USEPA-Landgem emissions program. The spreadsheet calculates NMOC and HAP emissions based upon a first-order decay equation. The model used the following values:

1. A potential yield (L_o) of 100 m^3/Mg of waste;
2. A decay rate (k) of 0.02 yr^{-1};
3. A deposition rate of 512,000 tons per year;
4. A compaction rate of 1,400 pounds per cubic yard; and
5. Incinerator ash is deposited at a rate of 63,000 tons per year.

The emission program calculated that an annual emission rate of 54.9 tons per year of NMOC will be generated by the landfill in its current configuration (no controls). Using the calculated emission amount with the control efficiencies of the collection (75%) and control (98%) systems, NMOC emissions from the landfill will be reduced from 54.0 tons per year to the following levels:

LANDFILL SURFACE NMOC EMISSIONS (with control and collection system)		
NMOC generation rate (obtained from EPA approved emissions program	54.9	tons per year
Landfill Gas Collection Efficiency	75%	
Surface Emission Rate (NMOC generation rate * (1 - landfill collection efficiency))	13.725	tons per year

To determine HAP emissions from the landfill surface, the following equations were used:

$$gravimetric\_concentration\left(\frac{mg}{m^3}\right) = ppmv \times \frac{Mol.Wt.\left(\frac{g}{g-mole}\right)}{24.04}$$

$$generation\_rate(tpy) = gravimetric\_concentration\left(\frac{mg}{m^3}\right) \times LFG\_Generation\_Rate\left(\frac{m^3}{yr}\right) \times \frac{2.2046 \times 10^{-6}\,lb}{mg} \times \frac{ton}{2000\,lb}$$

$$surface\_emission\_rate = generation\_rate \times (1 - LandfillGasCollectionEfficiency(\%))$$

$$Emissions\_to\_flare = generation\_rate \times LandfillGasCollectionEfficiency(\%)$$

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LANDFILL SURFACE HAP EMISSIONS						
LFG Generation Rate	23,370,074	m^3/yr				
Landfill Gas Collection Efficiency	75	percent				
Pollutant	**Median ppmv**	**Mol. Wt. (g/g-mole)**	**Grav. Conc. (mg/m^3)**	**Gen. Rate (tpy)**	**Surface Emissions (tpy)**	**Emissions to Flare (tpy)**
1,1,1-Trichloroethane (methyl chloroform)	0.48	133.41	2.61	0.0673	0.0168	0.0505
1,1,2,2-Tetrachloroethane	1.11	167.85	7.60	0.1958	0.0490	0.1469
1,1-Dichloroethane (ethylidene dichloride)	2.35	98.97	9.49	0.2445	0.0611	0.1834
1,1-Dichloroethene (vinylidene chloride)	0.2	96.94	0.79	0.0204	0.0051	0.0153
1,2-Dichloroethane (ethylene dichloride)	0.41	98.96	1.66	0.0427	0.0107	0.0320
1,2-Dichloropropane (propylene dichloride)	0.18	112.99	0.83	0.0214	0.0054	0.0161
2-Propanol (isopropyl alcohol)	50.1	60.11	122.92	3.1656	0.7914	2.3742
Acetone	7.01	58.08	16.62	0.4280	0.1070	0.3210
Acrylonitrile	6.33	53.06	13.71	0.3531	0.0883	0.2648
Bromodichloromethane	3.13	163.83	20.93	0.5390	0.1348	0.4043
Butane	5.03	58.12	11.93	0.3073	0.0768	0.2305
Carbon disulfide	0.58	76.13	1.80	0.0464	0.0116	0.0348
Carbon monoxide	141	28.01	161.2	4.1515	1.0379	3.1136
Carbon tetrachloride	0.004	153.84	0.03	0.0006	0.0002	0.0005
Carbonyl sulfide	0.49	60.07	1.20	0.0309	0.0077	0.0232
Chlorobenzene	0.25	112.56	1.15	0.0296	0.0074	0.0222
Chlorodifluoromethane	1.3	86.47	4.59	0.1182	0.0296	0.0887
Chloroethane (ethyl chloride)	1.25	64.52	3.29	0.0848	0.0212	0.0636
Chloroform	0.030	119.39	0.15	0.0038	0.0010	0.0029
Chloromethane	1.21	50.49	2.49	0.0642	0.0161	0.0482
Dichlorobenzene	0.21	147	1.26	0.0324	0.0081	0.0243
Dichlorodifluoromethane	15.7	120.91	77.48	1.9954	0.4989	1.4966
Dichlorofluoromethane	2.62	102.92	11.01	0.2835	0.0709	0.2126
Dichloromethane (methylene chloride)	14.3	84.94	49.58	1.2768	0.3192	0.9576
Dimethyl sulfide (methyl sulfide)	7.82	62.13	19.83	0.5107	0.1277	0.3830
Ethane	889	30.07	1091.11	28.1003	7.0251	21.0752
Ethanol	27.2	46.08	51.16	1.3175	0.3294	0.9881
Ethyl mercaptan (ethanethiol)	2.28	62.13	5.78	0.1489	0.0372	0.1117
Ethylbenzene	4.61	106.16	19.98	0.5144	0.1286	0.3858
Ethylene dibromide	0.001	187.88	0.01	0.0002	0.0001	0.0002
Fluorotrichloromethane	0.76	137.38	4.26	0.1098	0.0275	0.0824
Hexane (n)	6.57	86.18	23.11	0.5952	0.1488	0.4464
Hydrogen sulfide	35.5	34.08	49.38	1.2718	0.3180	0.9539
Mercury (total)	2.53E-04	200.61	0.00	0.0001	0.0000	0.0001
Methyl ethyl ketone	7.09	72.11	20.87	0.5374	0.1344	0.4031
Methyl isobutyl ketone	1.87	100.16	7.64	0.1969	0.0492	0.1477
Methyl mercaptan	2.49	48.11	4.89	0.1259	0.0315	0.0944
Pentane (n)	3.29	72.15	9.69	0.2495	0.0624	0.1871
Perchloroethylene (tetrachloroethylene)	3.73	165.83	25.25	0.6502	0.1626	0.4877
Propane	11.1	44.09	19.98	0.5144	0.1286	0.3858
t-1,2-dichloroethene	2.84	96.94	11.24	0.2894	0.0724	0.2171
Trichloroethylene (trichloroethene)	2.82	131.38	15.12	0.3895	0.0974	0.2921
Vinyl chloride	7.34	62.5	18.72	0.4822	0.1206	0.3617
Xylenes (mixed)	12.1	106.16	52.43	1.3503	0.3376	1.0127
Landfill Surface HAP Emissions					12.72	TPY

Abbreviations:
Mol. = Molecular
Wt. = Weight
Grav. = Gravimetric
Conc. = Concentration
Gen. = Generation

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Total Landfill Surface Emissions

Pollutant	Annual Emissions (TPY)	Notes
NMOC	13.725	
HAPs	12.72	No individual HAP greater than 10 tpy

Flare Emissions

Emission information for the control device (enclosed flare) was determined using the following information:

FLARE NMOC EMISSIONS (with control and collection system)		
NMOC generation rate (obtained from EPA approved emissions program	54.9	tons per year
Landfill Gas Collection Efficiency	75%	
Emissions to Flare (NMOC generation rate * landfill collection efficiency)	41.175	tons per year
Flare Control Efficiency	98%	
Flare Emission Rate (Emissions to Flare * (1 - flare control efficiency))	0.82	tons per year

Landfill Flare HAP Emissions			
Flare Capacity	30	MMBtu/hr	
Annual Flare Capacity	262,800	MMBtu/yr	
Pollutant	**Emission Factor (lbs/MMBTU)**	**Flare Emissions (lbs/yr)**	**Flare Emissions (tons/yr)**
NMOC	N/A[1]	1,647.00	0.82
Nitrogen Oxides	6.00E-02	15,768.00	7.88
Carbon Monoxide	2.00E-01	52,560.00	26.28
Sulfur Oxides	N/A[2]	5,008.88	2.5
Hazardous Air Pollutants[2]			
1,1,2-Trichloroethane	1.59E-05	4.18	2.09e-03
1,2,3-Trimethylbenzene	2.30E-05	6.04	3.02e-03
1,2,4-Trimethylbenzene	1.43E-05	3.76	1.88e-03
1,3,5-Trimethylbenzene	3.38E-05	8.88	4.44e-03
1,3-Butadiene	2.67E-04	70.17	3.51e-02
1,3-Dichloropropene	1.32E-05	3.47	1.74e-03
2-Methylnaphthalene	3.32E-05	8.72	4.36e-03
2,2,4-Trimethylpentane	2.50E-04	65.70	3.29e-02
Acenaphthene	1.25E-06	0.33	1.65e-04
Acenaphthylene	5.53E-06	1.45	7.25e-04
Acetaldehyde	4.24E-05	11.16	5.58e-03
Acrolein	9.87E-06	2.59	1.30e-03
Benzene	1.57E-04	41.25	2.06e-02
Benzo(b)fluoranthene	1.66E-07	0.04	2.00e-05
Benzo(e)pyrene	4.15E-07	0.11	5.50e-05
Benzo(g,h,i)perylene	4.14E-07	0.11	5.50e-05
Biphenyl	2.12E-04	55.71	2.79e-02
Butyr/Isobutyraldehyde	1.01E-04	26.54	1.33e-02
Chrysene	6.93E-07	0.18	9.00e-05

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Pollutant	Emission Factor (lbs/MMBTU)	Flare Emissions (lbs/yr)	Flare Emissions (tons/yr)
Cyclopentane	2.27E-04	59.66	2.98e-02
Ethylbenzene	1.43E-03	374.61	1.87e-01
Fluoranthene	1.11E-06	0.29	1.45e-04
Fluorine	5.67E-06	1.49	7.45e-04
Formaldehyde	1.15E-03	303.27	1.52e-01
Hexane (n)	2.86E-05	7.52	3.76e-03
Hydrogen Bromide	N/A[2]	391.34	1.96e-01
Hydrogen Chloride	N/A[2]	7,148.40	3.57e+00
Hydrogen Fluoride	N/A[2]	1,155.60	5.78e-01
Methanol	2.50E-03	657.00	3.29e-01
Methylcyclohexane	1.23E-03	323.24	1.62e-01
n-Nonane	1.10E-04	28.91	1.45e-02
n-Octane	3.51E-04	92.24	4.61e-02
Naphthalene	1.09E-05	2.85	1.43e-03
PAH	1.38E-05	3.63	1.82e-03
Phenanthrene	1.04E-05	2.73	1.37e-03
Phenol	2.40E-05	6.31	3.16e-03
Propylene	2.41E-03	633.00	3.17e-01
Pyrene	1.36E-06	0.36	1.80e-04
Toluene	5.73E-05	15.05	7.53e-03
Xylenes (mixed)	2.86E-05	7.52	3.76e-03
Total Combustion HAPS		11,525.41	5.76

[1] Obtained from manufacturer's specification sheets
[2] Obtained from mass balance equation. Refer to attachments for details.

The resultant total emissions from the facility is as follows:

Facility-Wide Emissions Summary (Tons/yr)[1]

Pollutant	Landfill Surface	Flare	Paved Roads	Unpaved Roads	Material Handling	Total Emissions
Landfill NMOC	13.73	0.82				14.55
PM			56.95	56.98	0.09	114.02
PM_{10}			11.10	17.44	0.04	28.58
PM_{25}	0.41		2.79	2.67	0.01	5.88
NO_x		7.88				7.88
SO_x		2.50				2.50
CO		26.28				26.28

[1] Refer to attachments for detailed emission calculations

AIR QUALITY ASSESSMENT:

To determine the ambient air impact from the gas collection and control system, the EPA approved SCREEN3 modeling program was used. Parameter settings used in the assessment included complex terrain, default meteorology, and a rural input setting. Building downwash was not considered, since no buildings are located in the vicinity of the landfill. The analysis only addressed emissions from the flare since it is the only point source of emissions. The input parameters used are:

EMISSION RATES AND STACK PARAMETERS FOR AIR MODELING

EMISSION RATES					STACK PARAMETERS			
SO_2 (g/s)	NO_x (g/s)	CO (g/s)	PM_{10} (g/s)	Pb (g/s)	Height (m)	Temp. (K)	Velocity (m/s)	Diameter (m)
1.000	1.000	1.000	N/A	N/A	12.2	1144	8.5	2.400

The result from the model demonstrated that the highest concentration was 11.4 μg/m^3 per g/s, based on a 24-hour period. To convert the result to a 1-hour period, the result is divided by the factor to convert a 1-hour concentration to a 24-hour concentration (0.4). The resulting 1-hour concentration is 28.5 μg/m^3 per g/s (11.4/0.4). This concentration is multiplied by the actual emission rate of each pollutant to determine the actual ambient air impact. A summary of the ambient air quality impacts is exhibited in the following table:

Normalized Concentration = 28.5 μg/m^3 per g/s

Pollutant	Avg. Period	Emission Rate (g/s)	Time Factor	CONCENTRATION (μg/m^3)				% of std.
				Conc.	Background[1]	Total	Std	
CO	1-HR	18.180	1.0	518.1	2508.0	3026.1	10,000	30.3
	8-HR	18.180	0.7	362.7	1055.0	1417.7	5,000	28.4
NO_x	Ann.	5.450	0.2	55.9	9.0	64.9	70	92.8
SO_2	3-HR	1.730	0.9	44.4	23.0	67.4	1,300	5.2
	24-HR	1.730	0.4	19.7	6.0	25.7	365	7.0
	Ann.	1.730	0.2	9.9	1.0	10.9	80	13.6

[1] Background concentration obtained from Kapolei Monitoring Station, 2000

The air modeling demonstrates that the operation of the equipment complies with State and Federal ambient air quality standards.

OTHER ISSUES:
None

SIGNIFICANT PERMIT CONDITIONS:
None; permit conditions taken verbatim from applicable federal regulations.

CONCLUSION AND RECOMMENDATION:
The Waimanalo Gulch Landfill Gas Collection and Control system complies with all applicable state and federal requirements. Recommend issuance of covered source permit pending 30 day public comment period and 45-day EPA review.

Kevin Kihara
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